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SCIENCE

IN THE

PHILIPPINES

A REVIEW BY

JAMES J. WALSH, Ph.D., M.D.

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Science in the Philippines.

A Review[1] *by James J. Walsh, Ph.D., M.D.*

1 THE PHILIPPINE ARCHIPELAGO.—A collection of geographical, statistical, chronological and scientific data relative to the Philippine Islands, and collected from former work, or obtained by the personal observation and study of some Fathers of the Society of Jesus in the islands. Printed at the Government Press, Washington, D. C., 1900.

THE controversy over the work of the religious orders in the Philippine Islands has recently entered upon an acute phase. This is mainly due to the overhasty (to say the least) utterances of a well-known dignitary of the Episcopal church who spent some four days in Manila and then came back to tell his countrymen all about it. The good man knew so little about the history of the religious orders, not alone in the Philippines but in general, that he says: "The Jesuits were expelled from the Philippines by an Apostolic Brief of Pope Clement XIV." It is evident that he is entirely ignorant of the complete suppression of the Jesuits all over the world brought about by political influences at that time and thinks that Clement XIV's brief referred only to the order in the Philippines. Then he adds: "It is quite true that they were permitted to return in 1852, but only on condition that they should confine their labors to strictly educational and missionary work."

How well the Jesuits did confine themselves to their educational work is best evidenced by these volumes which we have under review. Its publication just at the present time is apparently accidental. Needless to say it contains the results of the labors of many years, and might well have seen the light at any other time. It is such a timely contribution to the controversy at the present moment that its appearance just now seems almost providential.

Fortunately there are some Americans who are able to appreciate that a great problem whose evolution has been a matter of hundreds of years cannot be solved by the help of the data gathered in less than a week. The commissioners sent by the President of the United States to study the situation in the Philippines report its elements and advise as to the best manner of dealing with it were not of those who felt that they could exhaust the subject in the few short months they had to give to it. Accordingly they looked for help in the gathering of data and the elucidation of

1 El Archipiélago Filipino Colección de Datos Geográficos Estadísticos Cronológicos y Científicos Relativos al Mismo Entresacados de anteriores obras, ú obtenidos con la propia observación y estudio por algunos padres de la Misión de la Campañía de Jesús, en estas islas. Washington, Imprenta del Gobierno, 1900.

obscure points in the generally accepted traditions and conditions in the archipelago.

Admiral Dewey, who had been impressed with the difficulty of the task that confronted the commission, had learned during his months in Manila to appreciate the Jesuits in charge of the astronomical observatory at the Philippine capital. At his suggestion the Fathers were consulted by the commissioners. It was found that they had accumulated a vast amount of precious data with regard to nearly every subject of scientific interest in the islands. The director of the observatory, Father Algue, S.J., had already published a book on the cyclones of the Philippines, which was accepted as an authoritative work on the storms of Eastern lands. The commission very sensibly resolved to secure for the United States government all the valuable information that the laboratory staff had been so faithfully collecting for many years. The Jesuits were invited to write an account of the present status of scientific knowledge of the Philippines. The volumes we have for review are the result. For over a year Fathers Algue and Clos have been in Washington seeing the volumes through the government press.

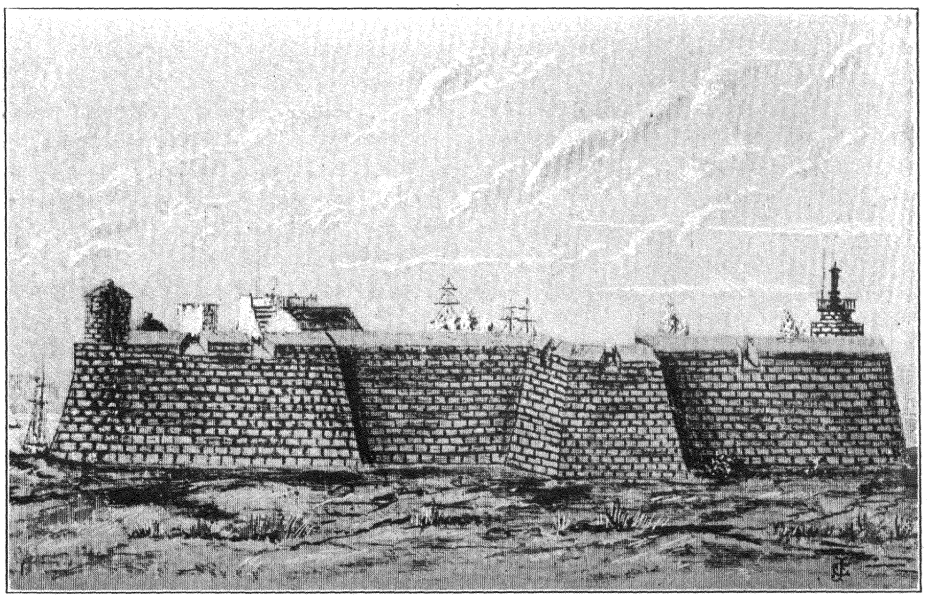
Those of us who know the thoroughness with which Jesuits perform a task committed to them will readily realize that the work is a storehouse of valuable information. More than this, it is the best possible answer to those who think always of members of religious orders as whiling away the time between their public and private orisons in idle contemplation or thoughtless ease. Under the manifold discouragements of the lackadaisical Spanish régime these devoted men have applied themselves faithfully to their scientific observations and investigations. In laborious silence their work has gone on, and now the fruit of it is a precious evidence of the deep purpose and loyal fulfillment of their duties as simple religious engaged in a great work.

The work consists of two volumes in large octavo of respectively 700 and 470 pages and an atlas containing 30 maps. The first volume contains the geographical description, the ethnology, geology, botany and zoölogy of the archipelago. The second volume has the climatology, the seismology and the data for the study of the terrestrial magnetism of the islands. The atlas is probably the most important part of the work. It represents the most nearly complete attempt to map out the Philippines that has yet been made.

The atlas has been adopted by the United States Geodetic and Coast Survey as the basis on which to build up the final geographical portrayal of the Philippine Islands. How thoroughly the editor's careful work in this matter is appreciated may be gathered from the words of Mr. Pritchett, the superintendent of the National Coast Survey Bureau. He says :

"Shortly after the Philippine commissioners reached Manila it was learned that a series of maps covering the more important islands of the archipelago was being prepared at the Jesuit observatory under the supervision of the director, Rev. José Algué, S.J.

"An inspection of such of the maps as already had been completed satisfied the commission that they were superior to anything hitherto published. It was learned that the Jesuit Fathers planned to make the series quite complete, but that they had no very definite ideas as to when the work would be completed or how the maps would be published eventually. The commission conceived the idea of securing their coöperation in the preparation of a comprehensive atlas of the archipelago, and with this end in view asked them to submit a tentative list of maps. The request was promptly complied with. After some discussion the series here published was decided upon.



CEBÚ FORTRESS, BUILT BY FATHER CAMPIÓN, S.J.

"The entire absence of accurate surveys of many of the islands was necessarily a serious drawback, but the Jesuits spared no pains in securing all available data and verified them by consultation with members of the other religious orders as well as with old residents, travellers and explorers. To the admirable work of their own order is due practically all of our present knowledge of the interior of Mindanao. While strictly accurate maps cannot be prepared until the necessary surveys have been made it is believed that this atlas fairly represents the present state of geographic knowledge of the Philippine archipelago and that it embodies a large amount of new information."

The maps are very beautifully executed, and admiration for the clever work done on them is increased when we learn that they were all done by native Philippine draughtsmen under the direction of the Fathers at the observatory of Manila. We have heard from many sources of the mechanical skill of the Filipinos. This is an ideal exemplification of it, and shows what training has been able to accomplish for the natives. It is evident that the Jesuits knew how to devote themselves to education not only by the collection and arrangement of scientific material, but by the training of assistants whose aid in the work became an important factor in its successful accomplishment. But for those who know them this is only another proof of their successful devotion to the work they were founded to accomplish, but which they are so often said to abandon for politics. While political questions, revolutions, plottings and counter-plottings, murmurings and dissatisfaction were so rife around them, in quiet scholarly obscurity the Jesuits were working out the scientific data of the Philippines getting it ready as a precious gift to the new century.

METEOROLOGY OF THE PHILIPPINES.

Probably the most original work in the book is embodied in the chapters on meteorology and climatology. Here Father Algue, the director of the observatory at Manila, was at home. His work on "Cyclones in the Philippines," published some years ago, made him

an acknowledged authority on Oriental meteorology. Under his direction, in the few years during which opportunities and facilities for the study have been afforded, so much has been accomplished that little remains to be done now save draw the practical conclusions that will make a firm basis for Philippine meteorology.

The tabulation of a large series of observations has enabled the directors of the observatory to deduce several laws as to barometric pressure and cyclonic storms which enable these serious cataclysms to be anticipated. Father Faura, S.J., after a series of observations extending over many years, established the following practical rule, which he set down as one of the principal precursory signs of a "temporal," that is an especially severe Philippine storm. "The weather must be considered suspicious as soon as there is any notable departure in barometric pressure from the normal barometric rhythm which follows the hour of the day and the season of the year." The regular barometric variations are worked out from a long series of observations. The greater or less violence of an anticipated typhoon can be foretold with almost absolute assurance. Father Faura's rule is: "The intensity of a typhoon depends on the amplitude of the deviation of the barometric indication from the exact and definitely known limit of normal nocturnal and diurnal oscillations of barometric pressure."

These deductions are of immense practical importance. They enable the meteorological observatory to foretell the coming of a storm hours before its violence is manifest and so enable sailors and agriculturists to take proper precautions for the preservation of vessels, of cattle and flocks and of crops that may be exposed to the storm.

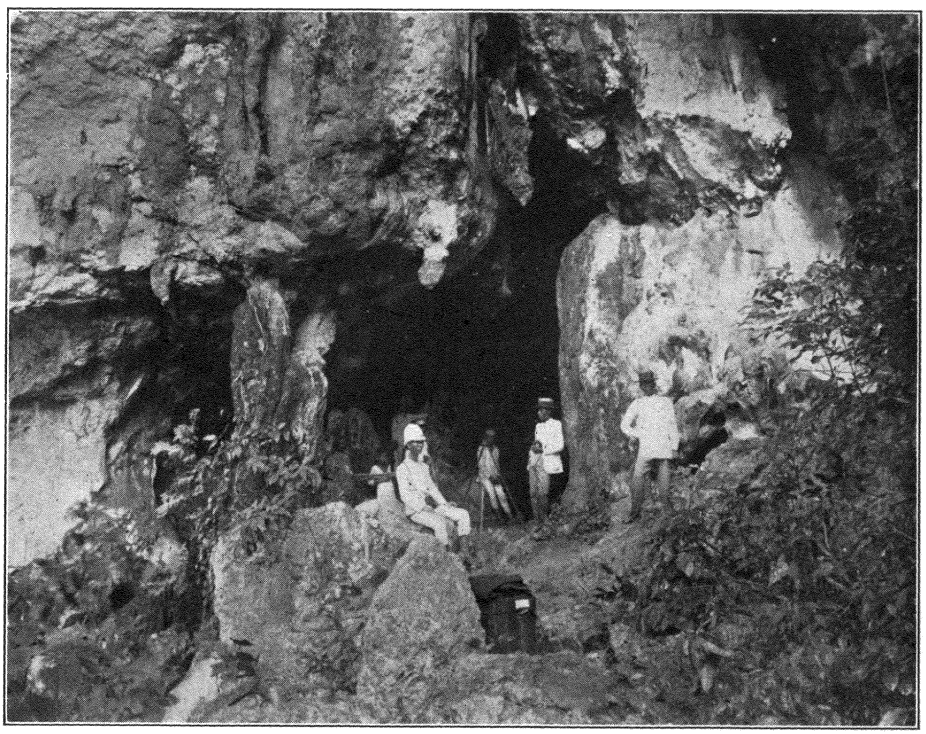
The careful observation of the height of special forms of clouds and of their velocity and direction has also given precious information with regard to these serious storms. On a number of occasions during the last four years, these cloud observations have enabled the directors of the observatory to suspect the approach of a storm even forty-eight hours before any change in barometric pressure took place. They have been enabled to announce, at least twenty-four hours before it broke, the direction and the probable violence of the storm. These results have been obtained only by the most careful collation of a large series of photo-grammetrical observations of cloud-heights, distances and movements.

In order to enable the masters of small vessels who are not in a position to carry instruments of precision with them to determine more or less exactly the approach of a severe storm, these observations of cloud forms have also been reduced to the form of rules whose application is not difficult. A notable increase or decrease in the height of clouds—that is, of any special form of cloud—is a signal for the approach of a storm. Various practical points are given by which the special cloud and the movements that announce a storm and the direction of its greatest violence can be determined. These practical instructions must be of great service even in their present incompleteness. They will undoubtedly form the basis for further valuable meteorological work in the Philippines.

SEISMOLOGY.

The chapters on seismology—that is, on the science of earthquakes—contain a large amount of suggestive and valuable scientific data that will undoubtedly be of great service in throwing light on some of the disputed points as to the origin of earthquakes. These chapters are the special work of Father Clos. Not so much time and labor were devoted to this subject as to that of climatology, and the reason is evident. The study of storms and their causes had an immediate practical importance for nav-

igation in the Philippine archipelago that naturally attracted more attention from the clerical scientists. The great question in seismology is, are earthquakes due to volcanic action or to causes cognate to those which produce volcanic action? That earthquakes are due to local conditions is now generally acknowledged. There are in the Philippines many active volcanoes and earthquakes are frequent. As yet no definite law of connection between these two manisfestations of subterraneous violence has been discovered, but some most suggestive material has been gathered at the Manila observatory.



CAVE OF BIACNABATÓ, BULOCÁN.—AGUINALDO'S TROOPS IN VIEW.

An added element of great importance in the study of the earthquakes of the Philippines has been the information obtained from distant missionaries. This has enabled the Jesuits to collect and collate data relating to widely separated phenomena of earthquakes. Certain laws as to the modification of the direction in which seismological disturbances travel as the result of local peculiarities of conformation have been worked out. The influence of mountain ranges particularly has been shown and the work of other observers in different parts of the world along the same line confirmed. It is to be hoped that this work with its precious promise of scientific fruitfulness will not be interrupted by the conditions that are to obtain under the new régime in the Philippines. The band of devoted men who from distant parts of the islands have made possible the comparative study of earthquake phenomena should not be disturbed in the labors voluntarily undertaken and carried out so well under discouraging circumstances.

MINERALOGY.

The mineralogy of the Philippines forms a subject of very special interest. Since we are irretrievably committed to the possession of the Philippines, it is important to know what resources of

the archipelago are capable of development. The outlook is most promising. There are veins of metal of various kinds that will well repay the prospector and miner and whose products will prove a source of industrial wealth in the East.

Copper has come to occupy a place next to iron in importance in the industrial world during recent years. A number of minerals containing this metal in large proportions exist in various islands in the Philippine group. Chalcosin, for instance, known popularly as vitreous copper and chemically as an impure copper sulphide, is found in considerable abundance. The mineral is one of the most appreciated sources of commercial copper. Specimens of it found in the Philippines assay as high as seventy-eight per cent. Chalcosin has been found in the mining region of Mancayan, Suyuc and Bumuncun in the province of Lepanto (Luzon). At Agbao (Lepanto) there are a number of irregular deposits of this mineral not quite as rich as in the other district. Specimens assay about 65 per cent. of copper.

Chalcopyrite is another abundant copper-yielding mineral. This is popularly known as copper pyrites. It is a mixture of copper and iron sulphide. The extraction of the copper is not very difficult. This also exists in the mining district of Mancayan and is very abundant at Suyuc and Bumuncun. The chalcopyrite found in the Philippines contains from twenty-five to forty per cent. of copper. It well repays working.

Zinc is found in two forms—the sulphide of zinc, popularly called blend, and silicate of zinc or calamine. These two minerals are found mainly in the Ambos Camarines provinces. Lead is found as sulphide of lead, ordinarily known as galena. As is well known galena furnishes by far the larger part of the lead of commerce. It is seldom found free, being usually associated with silver and occasionally with gold. The Philippine variety of the mineral is mainly auro-argentiferous and is found in the Ambos Camarines and on the Island Cebu. Argentiferous galena is found also at Surigao and Marinduque. There are numerous veins of iron that will well repay working. Tin is not so abundant. Silver seems to occur with extreme rarity on the islands, and then only in association with lead.

Minerals containing gold in considerable proportions are very well represented in the Philippines. They occur in nearly all the islands. Gold itself is also found free, and placer mining has been successful in a number of localities. Veins of gold-bearing quartz are not uncommon. The gold deposits best known are those at Cagayan, Demisamis and Surigao, on the island of Mindanao, and at Paracale and Mambulao in Ambos Camarines. At Gapan in the province of Nueva Ecija gold is found in the shape of nuggets, dust and crystals.

Combustible minerals are not very plentiful in the Philippines. Lignite, or fossil wood, consisting in variable proportions of from 50 to 75 per cent. of carbon, is rather abundant. It is found in a number of places on at least ten of the islands of the Philippine group. The island of Cebu is particularly rich in deposits of this material.

Until a few years ago the existence of petroleum in the Philippines was considered improbable, but now it is known to occur at a number of points on the island of Cebu and also on the island of Leyte. In recent years the discovery of even traces of petroleum in a region has usually been followed by the finding of oil in considerable amounts. It is not improbable that like the Texas and Southern California oil fields those in the Philippines may in the next few years prove a valuable resource.

Another form of carbonaceous material that in recent years has proved extremely valuable is asphalt. The world's demand for asphalt is only just begin-

ning and the known deposits of it are limited in amount. In the Philippines it is known to occur at Jinatuan and in Surigao and at several places in the Ambos Camarines provinces. Fossil resin is also found in considerable quantities in the islands.

In mineral waters the Philippines are especially rich. Acid waters containing iron exist in a number of places. Alkaline bicarbonate waters also occur. Sulphur water is found, also springs containing the salts of calcium and lithium and chlorides under various forms. A well-known set of springs that have a reputation as curative for lymphatism and scrofula and for chronic gastro-intestinal catarrh contain sulphur and calcium and certain mixed chlorides. According to the report the location of the spring is "en el pueblo de O'Donnell, Provincia de Tarlac," so that the proverbial Irishman would seem to have penetrated even to these distant parts, and the O'Donnells have given a name to a clan far from their original home. The designation of the region *Tarlac*, surely smacks of the native land of the man after whom the people is named.

ETHNOLOGY.

The chapter in the work most interesting to the general public will undoubtedly be that on ethnology. We may add that it is assuredly the most important part for those also who are to govern and manage this distant and practically unknown people. The origin of the Filipinos is very thoroughly discussed. Light is thrown on many vexed scientific questions in anthropology. The theory that the Filipinos are distinct from the other races of the South Sea Islands is impugned. This theory was upheld by certain prominent travellers and even by so distinguished an anthropologist as Virchow. The writers of this work show that the data on which this theory was founded, mainly skull measurements, were incomplete and the evidence inconclusive. Comparatively few skulls were studied and even these were not typical of the fundamental race that inhabits the Philippines.

The basic element of the Philippine people are the Negritos who came originally from the African continent. With them have mingled down the centuries

FRAMEWORK OF FILIPINO COTTAGE

the Malay, or Brown race—itself probably not distinct, but a mixture of races —and the Mongolians from the Chinese mainland and the Japanese Islands. The present inhabitants of the Philippines are thus by no means a single race to be treated on any broad general principles, but a collection of races whose management must be learned by personal contact with them.

It is evident that these mingled races will require most careful handling if they are to be raised out of their state of semi-barbarism and not merely made to disappear before the march of civilization. Unfortunately so far in the history of the human race, the weaker ones have inevitably melted away in the glare of what we are pleased to vaunt as our Christian civilization. They bear the "white man's burden" for a time and then vanish completely, to make way for the "heir to all the ages, in the foremost files of time."

What has been done for the Filipinos in the matter of education and religion is sketched succinctly but strikingly. There is a lesson in the story for those who would condemn unheard the religious orders of the Philippines and would contemn their work there. The story is very different from that we have had from other sources. We present in our illustration some of the churches that have been raised in the islands. Places of worship they are, but they stand also as great educative influences uplifting æsthetically as well as ethically. The Cathedral and San Sebastian's at Manila are works of art that cannot fail of understanding. Like the Cathedral of mediæval times the elevating power of their constant impressive presence must have done much to raise the human mind to that sphere where increasing mental development becomes a second nature. The church at Jolo is a sample of what has been done outside of Manila. The glimpse of an interior of a missionary church on the island of Mindanao shows what has been accomplished in a region where so-called civilization has failed entirely to penetrate. Of the interior of the island we know according to good authority only what has come to us by the self-sacrificing missionaries who have gone there.

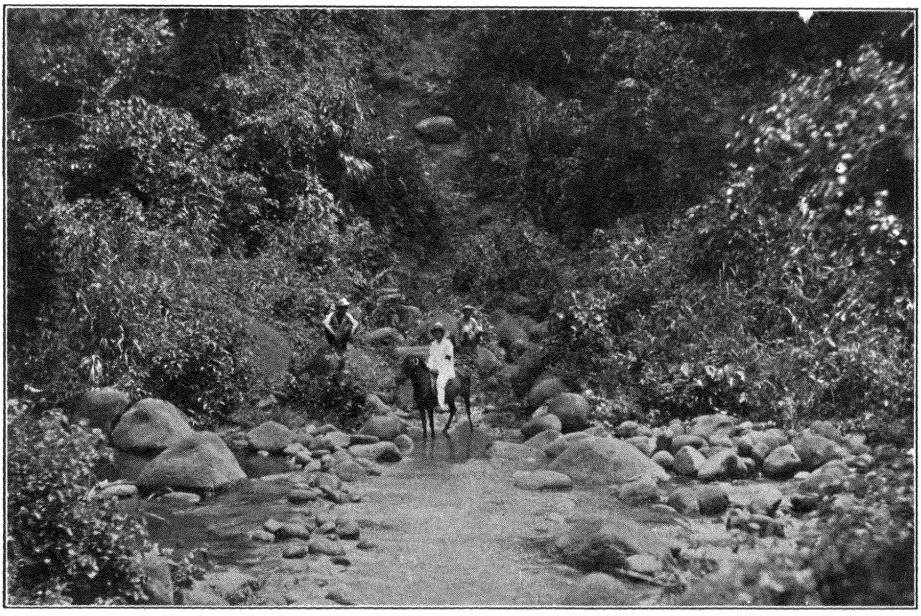
Besides church work other work for the benefit of the islands has not been neglected. The scientific interests the missionaries have had so much at heart and that they have kept ever in mind were reviewed in the beginning of this paper. One sample of other work that they have done may be noted in the illustration we give of the fortifications erected at Cebu under the direction of Father Campion of the Society of Jesus.

THE EDUCATION OF THE FILIPINOS.

The acquisition of the Philippines has given the United States another problem in the matter of education not unlike that which came after the Civil war, as the result of the freedom of the colored race. How ill that problem was handled we are only just beginning to realize. Our responsibility in the Philippines, where we have to deal with a confessedly inferior race, is all the more poignant for our previous failure. In recent times the hopeful sign in the treatment of the colored race here has been the establishment of our technical schools. Already the school system of the West Indies is undergoing reorganization. It will not be long before similar measures will be under consideration for the Philippines. It is interesting to note then that those who know the Filipinos best by personal contact have come to a conclusion in their regard very similar to that which it has taken our people nearly forty years to work out. As the result of their study of Philippine character, the Jesuits insist that for the education of the people of the archipelago two things especially are needed: First, general elementary education; second, special technical training. In this chapter on ethnology, they say:

"Speaking in general, it is conceded

that the Filipino race is intellectually inferior to the European races. This does not prevent native Filipinos, however, from demonstrating greater aptitude for certain work, and especially for manual occupations, in which the active use of the intelligence is very little required. They are, for example, usually very good penmen, good wood carvers, engravers and the like. In such occupations, given equal instruction, they surpass Europeans. It must be recognized, moreover, that they are very clever at the reproduction, putting together, imitation, modification, accommodation, and even the invention of apparatus, instruments and machines for definite purposes. Duly instructed, many of them become and have become skillful mechanics. In the use of their hands they easily excel foreigners who come in contact with them.



INLET OF BOTOCAN RIVER.

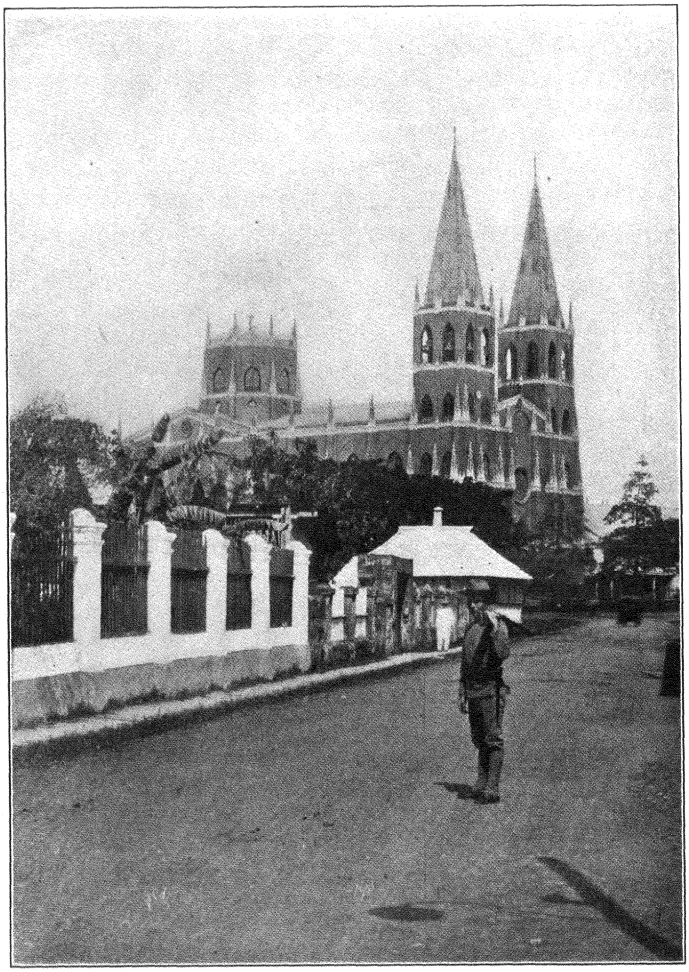
"In the fine arts they are wanting in genius, inspiration and power of conception. Usually, too, they lack sentiment and good taste. But they reproduce and copy with great fidelity and exactness anything beautiful which they see. In music and in poetry their defects are not so noticeable. In these they possess a certain force and variety of expression which is missed entirely in their painting and sculpture. It must be remembered that in strictly scientific and abstract knowledge there have occurred among the native Filipinos some minds far above the general average of humanity. In all the classes of our Municipal Athenæum natives have frequently distinguished themselves in purely intellectual work even in competition with Spanish fellow-students. The same thing is true in other institutions of learning here in Manila. In all the professions, and even in the faculties of the various educational institutions, there have always been native Filipinos and Indians of pure race who have obtained distinguished positions and merited renown by their intellectual attainments."

As to the question of limiting the education offered to the Filipinos because they are unsuited for the higher education, these very conservative yet progressive views are advanced :

"We believe that to solve the prob-

lem of the education of the Philippine people the following opinions will be found of practical service :

"First—Primary, elementary instruction must be diffused as widely as possible. In the larger centres of population high schools must be founded.



CHURCH OF SAN SEBASTIAN, MANILA.

"Second — The higher education should be decentralized. Independent colleges should be opened, in which a complete college course will be given and a salutary discipline established.

"Third—Those in charge of primary instruction must be brought up in contact with the Filipinos themselves. This is especially important for those charged with elementary teaching, but should be extended as far as possible to include also the higher education.

"Fourth—University studies and the collegiate courses should be open to every one. The standard required for continuance at the universities and the colleges should be high and the examinations should be rigorous.

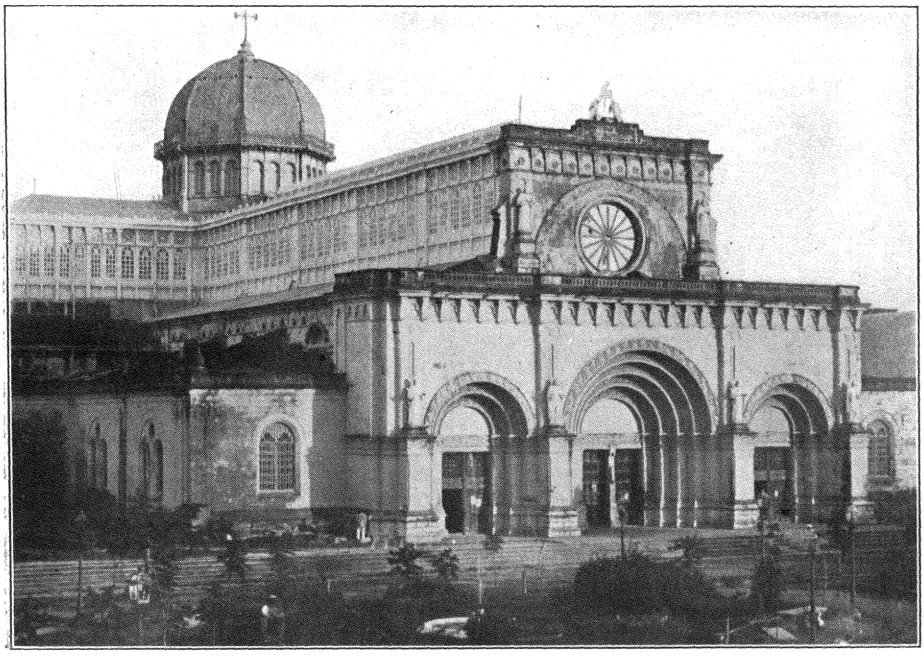
"Fifth—No department of knowledge, however lofty, sublime or abstract it may be, should be considered as above the native Filipinos. The mere question of race must not be allowed to decrease the opportunity the native may have for education since

experience shows that aptitude for the very highest studies is not lacking at least among chosen members of the race.

"Sixth—It is of the greatest importance to arouse and develop special attention in agriculture and in the manual arts, and to encourage the acquisition of the technical knowledge necessary for the advance and improvement of these methods of gaining a livelihood. Agricultural and technical schools should be established at various well-chosen points of the archipelago and model workshops, especially for the carving and engraving arts, should be fitted up. If technical instruction can be obtained without much expense there is no doubt that the Filipinos will take advantage of it and that the results will very soon be perceived."

We trust sincerely that this advice from men so thoroughly conversant with the situation in the Philippines will be well weighed by those who shall have the problem of education in the islands to deal with. Mistakes that will enevitably delay the development of the race can very easily be made. Cut and dried theories of education can not avail. They have not for our own superior races. The school system must work itself out according to the actual needs of the islanders and not be introduced as an exotic from without. To remove those who have shown themselves so well able to appreciate the situation is to invite failure.

This account of science in the Philippines is the best possible evidence of the good work that the religious orders have been doing in the archipelago. Such work is necessarily not prominently before the public and can easily be made little of by the prejudiced onlooker. Only those who have had practical experience with the collection and collation of series of observations know what tedious, time-taking work it is. The work must in the minds of competent critics prove the best answer to unthinking detraction. It is the dignified rebuke that religious humility dictates and yet the triumphant refutation of unfounded objections to old yet ever young and flourishing institutions.



THE CATHEDRAL, MANILA.

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THE MESSENGER OF THE SACRED HEART
NEW YORK
1901